* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to a solid state camera and its manufacture method.
[0002]
[Description of the Prior Art] In recent years, a solid state camera and its manufacture method are used for the noncommercial small video movie or the business-use high resolution video movie pan at the high definition still camera etc. Hereafter, the conventional solid state camera and an example of the manufacture method are explained. Although the conventional solid state camera constituted all the portions in the beginning using inorganic substances formed on the silicon substrate, such as aluminum wiring and a silicon oxide, forming the direct organic substance in the upper part of a solid state image pickup device, and attaining colorization of a solid state camera and high sensitivity-ization by the on-chip micro lens with small and highly-efficient-izing of a solid state image pickup device, is performed.
[0003]
[Problem(s) to be Solved by the Invention] However, with the above-mentioned conventional composition, the micro lens constituted with the light filter of the organic substance which discoloration produces by ultraviolet rays etc., and the organic substance which nebula-izing and a crack produce by ultraviolet rays is directly formed on a solid state image pickup device with the high reliability formed with the inorganic substance. For this reason, the direction of the solid state camera which formed the organic substance and attained highly efficient-ization from the life cycle solid-state-image-pickup-device independent [using the organic substance] had [the life cycle] the trouble of becoming short.
[0004] The purpose of this invention is offering the solid state camera which can reduce degradation of the optical property under the influence of ultraviolet rays etc., and can aim at extension of the improvement in reliability, and a life cycle, and its manufacture method.
[0005]
[Means for Solving the Problem] The solid state camera according to claim 1 prepared the inorganic transparent flat film in the upper surface of the solid state image pickup device which has the concave light-receiving section, and has prepared the convex type half ellipse type condensing inorganic micro lens in the position corresponding to the concave light-receiving section on the upper surface of an inorganic transparent flat film. A solid state camera according to claim 2 is characterized by making the cross-section configuration of a convex type half ellipse type condensing inorganic micro lens into the continuous false sine wave configuration in a solid state camera according to claim 1.
[0006] A solid state camera according to claim 3 is characterized by establishing Isshiki or the multicolor inorganic light-filter block which had the tint which carries out particle distribution and considers [an inorganic transparent material] an inorganic pigment or an organic coloring matter with high lightfastness as a request at a coplanar in the interior of an inorganic transparent flat film in a solid state camera according to claim 1 or 2. The solid state camera according to claim 4 makes the inorganic light-filter block the multilevel structure in the solid state camera according to claim 3.
[0007] The process to which the manufacture method of a solid state camera according to claim 5 carried out the rotation application of the sol-like glass liquid on the upper surface of a solid state image pickup device and which carries out after low-temperature heating and forms a gel glass membrane, The process which the upper surface of a gel glass membrane is softened by low-temperature heating, and forms an organic flat film in it after carrying out the rotation application of the thermoplastic synthetic resin, The process in which the etch rate of an organic flat film and a gel glass membrane carries out continuation dry etching of an organic flat film and the gel glass membrane under the conditions which become equal, and forms the 1st gel glass flat film, The process which carried out the rotation application of the sol-like glass liquid on the upper surface of the 1st gel glass flat film and which carries out after low-temperature heating and forms the 2nd gel glass flat film, The process which forms a convex type half ellipse type organic micro lens in the upper surface of the 2nd gel glass flat film, Continuation dry etching of the 2nd gel glass flat film is carried out to a convex type half ellipse type organic micro lens under the conditions to which the etch rate of a convex type half ellipse type organic micro lens and the 2nd gel glass flat film becomes equal. The process which forms a convex type half ellipse type condensing gel glass micro lens is included.
[0008] The process to which the manufacture method of a solid state camera according to claim 6 carried out the rotation application of the sol-like glass liquid on the upper surface of a solid state image pickup device and which carries out after low-temperature heating and forms a gel glass membrane, The process which the upper surface of a gel glass membrane is

softened by low-temperature heating, and forms an organic flat film in it after carrying out the rotation application of the thermoplastic synthetic resin, The process in which the etch rate of an organic flat film and a gel glass membrane carries out continuation dry etching of an organic flat film and the gel glass membrane under the conditions which become equal, and forms the 1st gel glass flat film, The process which carried out the rotation application of the sol-like glass liquid on the upper surface of the 1st gel glass flat film and which carries out after low-temperature heating and forms the 2nd gel glass flat film, The process which forms a convex type half ellipse type organic micro lens in the upper surface of the 2nd gel glass flat film, The process which forms the false sine wave type organic micro lens which carried out the rotation application of the viscous low organic micro-lens material, and followed the upper surface of a convex type half ellipse type organic micro lens, Continuation dry etching of the 2nd gel glass flat film is carried out to a false sine wave type organic micro lens under the conditions to which the etch rate of a false sine wave type micro lens and the 2nd gel glass flat film becomes equal. The process which forms a false sine wave type condensing gel glass micro lens is included.

[0009] The process to which the manufacture method of a solid state camera according to claim 7 carried out the rotation application of the sol-like glass liquid on the upper surface of a solid state image pickup device and which carries out after low-temperature heating and forms a gel glass membrane, The process which the upper surface of a gel glass membrane is softened by low-temperature heating, and forms an organic flat film in it after carrying out the rotation application of the thermoplastic synthetic resin, The process in which the etch rate of an organic flat film and a gel glass membrane carries out continuation dry etching of an organic flat film and the gel glass membrane under the conditions which become equal, and forms the 1st gel glass flat film, The light-filter layer formation process which carried out the rotation application of the sol-like glass liquid which made the upper surface of the 1st gel glass flat film carry out particle distribution of an inorganic pigment or the organic coloring matter with high lightfastness and which carries out after low-temperature heating and forms an inorganic light-filter layer, The resist pattern formation process which performs selection exposure development on the upper surface of an inorganic light-filter layer, and forms a desired resist pattern in it after carrying out the rotation application of the photosensitive resist, The light-filter block formation process which carries out dry etching of the inorganic light-filter layer by using a resist pattern as a mask, and forms an inorganic light-filter block, The process which forms a multicolor inorganic light-filter block in a coplanar by repeating a light-filter block formation process from a light-filter layer formation process about another color considered as a request, The process which forms the gel glass flat film of a wrap 2nd for a multicolor inorganic light-filter block like the 1st gel glass flat film, and the process which forms a condensing gel glass micro lens in the upper surface of the 2nd gel glass flat film are included.

[0010] The process to which the manufacture method of a solid state camera according to claim 8 carried out the rotation application of the sol-like glass liquid on the upper surface of a solid state image pickup device and which carries out after low-temperature heating and forms a gel glass membrane, The process which the upper surface of a gel glass membrane is softened by low-temperature heating, and forms an organic flat film in it after carrying out the rotation application of the thermoplastic synthetic resin, The process in which the etch rate of an organic flat film and a gel glass membrane carries out continuation dry etching of an organic flat film and the gel glass membrane under the conditions which become equal, and forms the 1st gel glass flat film, The light-filter stratification process which carried out the rotation application of the sol-like glass liquid which made the upper surface of the 1st gel glass flat film carry out particle distribution of an inorganic pigment or the organic coloring matter with high lightfastness and which carries out after low-temperature heating and forms the 1st inorganic light-filter layer, The resist pattern formation process which performs selection exposure development on the upper surface of the 1st inorganic light-filter layer, and forms the 1st desired resist pattern in it after carrying out the rotation application of the photosensitive resist, The light-filter block formation process which carries out dry etching of the 1st inorganic light-filter layer by using the 1st resist pattern as a mask, and forms the 1st inorganic light-filter block, The process which forms a multicolor inorganic light-filter block in a coplanar by repeating a light-filter block formation process from a light-filter stratification process about another color considered as a request, The process which carried out the rotation application of the sol-like glass liquid containing another inorganic pigment considered as a request on the upper surface of an inorganic light-filter block, or the organic coloring matter with high lightfastness and which carries out after low-temperature heating and forms the 2nd inorganic light-filter layer, The process which performs selection exposure development on the upper surface of the 2nd inorganic light-filter layer, and forms the 2nd desired resist pattern in it after carrying out the rotation application of the photosensitive resist, The process which carries out dry etching of the 2nd inorganic light-filter layer by using the 2nd resist pattern as a mask, and forms a multi-stage inorganic light-filter block, The process which forms the gel glass flat film of a wrap 2nd for a multi-stage inorganic light-filter block like the 1st gel glass flat film, and the process which forms a condensing gel glass micro lens in the upper surface of the 2nd gel glass flat film are included.

[0011]

[Function] According to the solid state camera and its manufacture method of this invention, by constituting all of the micro lens and light filter which are directly formed on a solid state image pickup device from an inorganic substance, degradation of the optical property under the influence of ultraviolet rays etc. can be reduced, and improvement in reliability of a solid state camera and extension of a life cycle can be aimed at.

[0012]

[Example] Hereafter, the example of this invention is explained, referring to a drawing.

The [1st example] Drawing 1 shows the cross section of the solid state camera of the 1st example of this invention. Setting to drawing 1 , for a solid state image pickup device and 2, a concave photodiode (concave light-receiving section) and 3 are [1]

SiO2. A [silicate glass] transparent flat film (inorganic transparent flat film) and 4 are half-ellipse type SiO2. It is a micro lens (convex type half ellipse type condensing inorganic micro lens).

[0013] This solid state camera is SiO2 with the high visible light transmittance formed in the upper part of the concave photodiode 2 in a solid state image pickup device 1 with gel glass material. The transparent flat film 3 is formed and it is SiO2 further. The high gel glass material of a visible light transmittance same with the upper part of the transparent flat film 3 is used, and it is half-ellipse type SiO2. The micro lens 4 is formed. For this reason, half-ellipse type SiO2 The concave photodiode 2 is made to condense the light which has carried out incidence to the micro lens 4, and the improvement in reliability and the extension of a life cycle by high-sensitivity-izing and all mineralization of a solid state camera can be aimed at.

[0014] The [2nd example] Drawing 2 shows the cross section of the solid state camera of the 2nd example of this invention. Setting to drawing 2 , 5 is sinusoidal type SiO2. It is a micro lens (convex type half ellipse type condensing inorganic micro lens), and others are the same as that of drawing 1 . At the 1st example, it is half-ellipse type SiO2 of drawing 1 . The light which carried out incidence to the flat field between lenses of a micro lens 4 is SiO2. It is not condensed by the concave photodiode 2 in order to carry out incidence perpendicularly to the transparent flat film 3. Therefore, at this example, it is half-ellipse type SiO2 of drawing 1 . Sinusoidal type SiO2 which shows a micro lens 4 to drawing 2 By transposing to a micro lens 5, it is SiO2. It is made to make the quantity of light of the light which the light which carries out incidence perpendicularly to the transparent flat film 3 is decreased, and can condense to the concave photodiode 2 increase. Thereby, high sensitivity-ization of a solid state camera can be attained more.

[0015] The [3rd example] Drawing 3 shows the cross section of the solid state camera of the 3rd example of this invention. Setting to drawing 3 , 6 is SiO2. For a transparent flat film (inorganic transparent flat film) and 7, as for a yellow pigment distribution film and 9, a Magenta pigment distribution film and 8 are [a green pigment distribution film and 10] cyano pigment distribution films, and others are the same as that of drawing 1 .

[0016] At the 1st and the 2nd example, it is SiO2. The transparent flat film 3 is transparent and colorless, and since all the lights are made to penetrate, it cannot respond to colorization of a solid state camera. Then, it is SiO2, respectively about the Magenta pigment distribution film 7 which ground the inorganic pigment like drawing 3 in this example to the particle below 50nmphi which does not produce reduction of a visible light transmittance, and was uniformly distributed to gel glass material, the yellow pigment distribution film 8, the green pigment distribution film 9, and the cyano pigment distribution film 10. It arranged on the transparent flat film 3, it blocked so that it might become the tint considered as a request, and the inorganic light-filter block is established And they are these inorganic light-filter blocks SiO2 It covers by the transparent flat film 6, and is this SiO2. It is half-ellipse type SiO2 on the transparent flat film 6. The micro lens 4 is formed.

[0017] According to this example, while being able to aim at the improvement in reliability and the extension of a life cycle by high-sensitivity-izing and all mineralization of a solid state camera, colorization of a solid state camera with high reliability with little influence of fading by ultraviolet rays can be attained.

The [4th example] Drawing 4 shows the cross section of the solid state camera of the 4th example of this invention. In drawing 4 , the same sign as drawing 3 is the same.

[0018] At the 3rd example, it is SiO2. The inorganic light-filter block of a total of four colors of the Magenta pigment distribution film 7, the yellow pigment distribution film 8, the green pigment distribution film 9, and the cyano pigment distribution film 10 was established on the transparent flat film 3 at the coplanar. However, in this example, since color mixture of it is not carried out even if it carries out the laminating of the inorganic pigment distribution film, as shown in drawing 4 , by carrying out the laminating of the cyano pigment distribution film 10 on the yellow pigment distribution film 8, it can compound the same color as the green pigment distribution film 9 of drawing 3 , can reduce the kind of pigment needed for colorization from four kinds to three kinds, and can attain shortening of a manufacturing process by this example.

[0019] In addition, it sets in the above 3rd and the 4th example, and is half-ellipse type SiO2. Sinusoidal type SiO [in / the 2nd example / instead of a micro lens 4]2 You may form a micro lens 5. Moreover, you may use an organic coloring matter with high lightfastness instead of an inorganic pigment.

The [5th example] Drawing 5 is the process cross section showing the manufacture method of the solid state camera of the 5th example this invention. Setting to drawing 5 , for a gel glass membrane and 11, a thermoplastic organic flat film and 12 are [3a] SiO2. As for a transparent flat film (2nd gel glass flat film) and 13, a photosensitive organic micro-lens material and 14 are convex type half ellipse type organic micro lenses. In addition, the SiO2 transparent flat film 3 is the 1st gel glass flat film and half-ellipse type SiO2. A micro lens 4 corresponds to a convex type half ellipse type condensing gel glass micro lens.

[0020] In drawing 5 (a), after carrying out the rotation application of the sol-like glass liquid (tetrapod ethoxy silane =TEOS), it heats on the upper surface of the concave photodiode 2 in a solid state image pickup device 1 for 5 minutes at 150 degrees C, and gel glass-membrane 3a of 5-micrometer ** is formed in it. After carrying out the rotation application of the thermoplastic synthetic resin, the upper surface of gel glass-membrane 3a is made to carry out heating softening for 5 minutes at 130 degrees C, and the thermoplastic organic flat film 11 is formed in it.

[0021] It is CF4 at the degree of vacuum of 0.05Torr(s) to which the etch rate of the thermoplastic organic flat film 11 and gel glass-membrane 3a becomes equal in drawing 5 (b). : Continuation dry etching of the gel glass-membrane 3a is carried out to the thermoplastic organic flat film 11 by the quantity-of-gas-flow ratio of O2 =1:4. In drawing 5 (c), over etching of the gel glass-membrane 3a is carried out until the thermoplastic organic flat film 11 disappears completely, and it is SiO2. The transparent flat film 3 is formed.

[0022] It sets to drawing 5 (d) and is SiO2. On the upper surface of the transparent flat film 3, after carrying out the rotation

application of the sol-like glass liquid, it heats for 5 minutes at 150 degrees C, and it is SiO2 of 1-3-micrometer **. The transparent flat film 12 is formed. SiO2 The rotation application of the photosensitive organic micro-lens material 13 was carried out, and back selection exposure is carried out on the upper surface of the transparent flat film 12. In drawing 5 (e), the photosensitive organic micro-lens material 13 is developed.

[0023] In drawing 5 (f), heating deformation of the photosensitive organic micro-lens material 13 is carried out for 2 minutes at 150 degrees C, and the convex type half ellipse type organic micro lens 14 is formed. It sets to drawing 5 (g) and they are the convex type half ellipse type organic micro lens 14 and SiO2. They are the convex type half ellipse type organic micro lens 14 and SiO2 under the conditions to which the etch rate of the transparent flat film 12 becomes equal. Continuation dry etching of the transparent flat film 12 is carried out.

[0024] It is SiO2 until the convex type half ellipse type organic micro lens 14 disappears completely in drawing 5 (h). Over etching of the transparent flat film 12 is carried out, and it is convex type half ellipse type SiO2. A micro lens 4 is formed. According to this example as mentioned above, it is half-ellipse type SiO2. The solid state camera which the concave photodiode 2 is made to condense the light which has carried out incidence to the micro lens 4, and can aim at the improvement in reliability and the extension of a life cycle by high-sensitivity-izing and all mineralization of a solid state camera is realizable.

[0025] The [6th example] Drawing 6 is the process cross section showing the manufacture method of the solid state camera of the 6th example this invention. In drawing 6 , 15 is a sinusoidal type organic micro lens (false sine wave type organic micro lens). In addition, sinusoidal type SiO2 A micro lens 5 corresponds to a false sine wave type condensing gel glass micro lens.

[0026] It sets to drawing 6 (a) and is SiO2. The process which forms the convex type half-ellipse type organic micro lens 14 of the transparent flat film 12 is the same as drawing 5 (a) - (f). In drawing 6 (b), the rotation application of the organic micro-lens material which lowered viscosity even to 10-20cp is carried out, and the continuous sinusoidal type organic micro lens 15 is formed in the upper surface of the convex type half ellipse type organic micro lens 14.

[0027] It sets to drawing 6 (c) and they are the sinusoidal type organic micro lens 15 and SiO2. Under the conditions to which the etch rate of the transparent flat film 12 becomes equal, they are the sinusoidal type organic micro lens 15 and SiO2. Continuation dry etching of the transparent flat film 12 is carried out, and it is sinusoidal type SiO2. A micro lens 5 is formed. according to this example as mentioned above -- half-ellipse type SiO2 of the 5th example instead of [of a micro lens 4] -- sinusoidal type SiO2 forming a micro lens 5 -- SiO2 the quantity of light of the light which the light which carries out incidence perpendicularly to the transparent flat film 3 is decreased, and can condense to the concave photodiode 2 -- increasing -- more -- high sensitivity -- a-izing solid state camera is realizable

[0028] The [7th example] Drawing 7 is the process cross section showing the manufacture method of the solid state camera of the 7th example this invention. In drawing 7 , 16 is the resist pattern formed by the photosensitive resist. In addition, SiO2 The transparent flat film 3 is the 1st gel glass flat film and SiO2. For the 2nd gel glass flat film and Magenta pigment distribution film 7a, an inorganic light-filter layer, the Magenta pigment distribution film 7, the yellow pigment distribution film 8, the green pigment distribution film 9, and the cyano pigment distribution film 10 are [the transparent flat film 6] an inorganic light-filter block and convex type half ellipse type SiO2, respectively. A micro lens 4 corresponds to a condensing gel glass

[0029] It sets to drawing 7 (a) and is SiO2. The process which forms the transparent flat film 3 is the same as drawing 5 (a) - (c). It is SiO2 about the Magenta pigment-content powder material which ground the Magenta inorganic pigment to the particle below 50nmphi of the grade which does not reduce the permeability of the light, and was uniformly distributed in sol-like glass liquid. On the transparent flat film 3, after carrying out a rotation application, it heats for 5 minutes at 150 degrees C, and Magenta pigment distribution film 7a of 0.5-2-micrometer ** is formed. The resist pattern 16 which carried out the rotation application of the photosensitive resist, which carries out back selection exposure development and which is considered as a request is formed on Magenta pigment distribution film 7a.

[0030] In drawing 7 (b), the Magenta pigment distribution film 7 of the block configuration which carries out dry etching of the Magenta pigment distribution film 7a by using the resist pattern 16 as a mask, and is considered as a request is formed. In drawing 7 (c), the yellow pigment distribution film 8 of the block configuration considered as a request by the same method as drawing 7 (a) - (b), the green pigment distribution film 9, and the cyano pigment distribution film 10 are formed.

[0031] It sets to drawing 7 (d) and is SiO2. It is SiO2 so that the pigment distribution film of four colors formed on the transparent flat film 3 may be covered. It is SiO2 about the transparent flat film 6. It forms by the same method as the transparent flat film 3. It sets to drawing 7 (e) and is SiO2 with the same method as drawing 5 (d) - (h). Transparent flat film 6 convex type half-ellipse type SiO2 A micro lens 4 is formed.

[0032] According to this example, while being able to aim at the improvement in reliability and the extension of a life cycle by high-sensitivity-izing and all mineralization of a solid state camera, the reliable solid state camera which can attain colorization with little influence of fading by ultraviolet rays is realizable.

[Example of the octavus] Drawing 8 is the process cross section showing the manufacture method of the solid state camera of the example of the octavus this invention.

[0033] It sets to drawing 8 (a) and is SiO2 with the same method as drawing 7 (a) - (c) about the Magenta pigment distribution film 7 and the yellow pigment distribution film 8. It forms on the transparent flat film 3. On the yellow pigment distribution film 8, a rotation application is carried out and the cyano pigment distribution film 10 is formed. On the cyano pigment distribution film 10, the rotation application of the photosensitive resist was carried out, back selection exposure development is carried out and the resist pattern (2nd resist pattern) 17 is formed.

[0034] In drawing 8 (b), the two-step green composition light filter which carried out dry etching of the cyano pigment

distribution film 10 by having used the resist pattern 17 as the mask, and carried out the laminating of the yellow pigment distribution film 8 and the cyano pigment distribution film 10 is formed. It sets to drawing 8 (c) and is SiO2 with the same method as drawing 7 (d). The transparent flat film (2nd gel glass flat film) 6 is formed so that a pigment distribution film may be covered.
[0035] It sets to drawing 8 (d) and is SiO2 with the same method as drawing 7 (e). The half-ellipse type micro lens 4 is formed on the transparent flat film 6. In addition to the effect of the 7th example, by carrying out the laminating of the cyano pigment distribution film 10 on the yellow pigment distribution film 8, the same color as the green pigment distribution film 9 (refer to drawing 7) of the 7th example can be compounded, the kind of pigment needed for colorization can be reduced from four kinds to three kinds, and, according to this example, shortening of a manufacturing process can be attained.
[0036] in addition, the example of the 7th octavus of the above -- setting -- half-ellipse type SiO2 instead of [of a micro lens 4] -- the 6th example -- like -- sinusoidal type SiO2 the quantity of light of the light which can condense to the concave photodiode 2 by forming a micro lens 5 -- increasing -- more -- high sensitivity -- a-izing solid state camera is realizable In addition, although the tetrapod ethoxy silane (TEOS) was used as an inorganic transparent glass material in the above-mentioned example, an inorganic transparent glass material is not limited to a tetrapod ethoxy silane, and is good anything, if it is the glass material in which the low-temperature glass-membrane formation by the sol-gel method is possible.
[0037] Moreover, an inorganic light-filter material made [the tetrapod ethoxy silane] to carry out particle distribution may not be limited to four colors of a Magenta, yellow, green, and cyanogen, and any color is sufficient as it. For example, there are red, blue, black, etc. In addition, you may use an organic coloring matter with high lightfastness instead of an inorganic pigment. Moreover, in the example, although the solid state camera was explained, equipment is applied to all the equipments that are limited to a solid state camera and that are not carried out and use a light filter and a micro lens. For example, they are a plasma display device (PDP), a liquid crystal display device (LCD), etc.
[0038]
[Effect of the Invention] As mentioned above, by constituting all of the micro lens and light filter which are directly formed on a solid state image pickup device from an inorganic substance, this solid state camera and its manufacture method can reduce degradation of the optical property under the influence of ultraviolet rays etc., and can aim at improvement in reliability of a solid state camera, and extension of a life cycle.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the cross section of the solid state camera of the 1st example of this invention.
[Drawing 2] It is the cross section of the solid state camera of the 2nd example of this invention.
[Drawing 3] It is the cross section of the solid state camera of the 3rd example of this invention.
[Drawing 4] It is the cross section of the solid state camera of the 4th example of this invention.
[Drawing 5] It is the process cross section showing the manufacture method of the solid state camera of the 5th example this invention.
[Drawing 6] It is the process cross section showing the manufacture method of the solid state camera of the 6th example this invention.
[Drawing 7] It is the process cross section showing the manufacture method of the solid state camera of the 7th example this invention.
[Drawing 8] It is the process cross section showing the manufacture method of the solid state camera of the example of the octavus this invention.
[Description of Notations]
1 Solid State Image Pickup Device
2 Concave Photodiode
3a Gel glass membrane
3 SiO2 Transparent Flat Film
4 Half-Ellipse Type SiO2 Micro Lens
5 Sinusoidal Type SiO2 Micro Lens
6 SiO2 Transparent Flat Film
7a Magenta pigment distribution film
7 Magenta Pigment Distribution Film
8 Yellow Pigment Distribution Film
9 Green Pigment Distribution Film
10 Cyano Pigment Distribution Film
11 Thermoplastic Organic Flat Film
12 SiO2 Transparent Flat Film
14 Convex Type Half Ellipse Type Organic Micro Lens
15 Sinusoidal Type Organic Micro Lens
16 Resist Pattern
17 Resist Pattern

[Translation done.]